Functionalized PPO and polyolefin low dielectric thermosetting blend

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Polyphenylene ether (PPO) resin is widely used as matrix resin for the production of printed circuit boards (PCBs) in the electronics industry because it has high comprehensive properties, including excellent dielectric properties, outstanding mechanical properties and good resistance against acids and alkalis [1]. However, there are weaknesses for PPO such as difficulty in processing, poor resistance to organic solvents and insufficient thermal resistance, which limits its applications in the field of microelectronic devices. To overcome these barriers, many efforts have been made to modify PPO, such as compounding with other thermosetting resins, especially epoxy resin [2]. But the introduction of polar group of these thermosetting resins, leading to poor dielectric properties. Hence, it is significant to develop a facile and effective method to reinforce the properties of PPO while retaining excellent dielectric properties.

Polyolefin has a very weak polarity and groups capable of crosslinking, so it can be used as an effective curing agent to blend with PPO. In this work, a modified PPO curing system were obtained by introducing functional groups containing double bonds to both ends of PPO and copolymerizing the functionalized PPO with polyolefin at a high temperature in the presence of a peroxide. In order to improve the processing properties of PPO, low molecular weight PPO, which can dissolve easily at room temperature, was used as raw material. The result indicated that by adding Polyolefin, the organic solvent resistance and thermal stability of the resulting blend was significantly improved, while good dielectric performance was retained. With the amount of polyolefin increased, the dielectric constant of the thermosetting blend decreased, but excessive addition of the polyolefin reduced the thermal stability of the blend. When the mass ratios of polyolefin in the composite were 0.4, the curing system displayed low dielectric constant of less than 2.75 and high thermal decomposition temperature (more than 400 °C).

1. Y.Q. Wang, Y.Q. Tao, J.F. Zhou, et al., *ACS Sustainable Chem. Eng*. **6**, 9277 (2018).
2. C.H. Chen, K.W. Lee, C.H. Lin, et al., *Polymers* **10**, 411 (2018).